การพัฒนาแมโครบนไมโครซอฟท์เอ็กซ์เซลสำหรับงานด้านการบริหารทรัพยากรบุคคล
โดยใช้ภาษาวิชวลเบสิกสำหรับแอปพลิเคชัน

The Development of Macro in Microsoft Excel
for Human Resource Management using Visual Basic for Applications

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บทคัดย่อ

  การวิจัยครั้งนี้มีวัตถุประสงค์ คือ 1) เพื่อพัฒนาแมโครบนไมโครซอฟท์เอ็กซ์เซลสำหรับงานด้านการบริหารทรัพยากรบุคคล โดยใช้ภาษาวิชวลเบสิกสำหรับแอปพลิเคชัน และ 2) เพื่อประเมินคุณภาพของแมโครบนไมโครซอฟท์เอ็กซ์เซลสำหรับงานด้านการบริหารทรัพยากรบุคคล โดยใช้ภาษาวิชวลเบสิกสำหรับแอปพลิเคชัน ซึ่งพัฒนาขึ้นโดยใช้กรอบแนวคิดกระบวนการพัฒนาระบบ (System Development Life Cycle) ประกอบด้วย 7 ขั้นตอน ได้แก่ 1) เข้าใจปัญหา (Problem Recognition) 2) ศึกษาความเป็นไปได้ (Feasibility Study) 3) วิเคราะห์ (Analysis) 4) ออกแบบ (Design) 5) สร้างหรือพัฒนา (Construction) 6) ปรับเปลี่ยน (Conversion) และ 7) บำรุงรักษา (Maintenance) กลุ่มผู้ให้ข้อมูล คือ บุคลากร สำนักงานบริหารทรัพยากรบุคคล สำนักงานอธิการบดี สถาบันเทคโนโลยีพระจอมเกล้าเจ้าคุณทหารลาดกระบัง จำนวน 39 คน เครื่องมือที่ใช้ในการวิจัย คือ 1) แมโครบนไมโครซอฟท์เอ็กซ์เซล และ 2) แบบประเมินคุณภาพของแมโครบนไมโครซอฟท์เอ็กซ์เซล ซึ่งมีค่าดัชนีสอดคล้อง (IOC) ระหว่าง 0.67 - 1.00 และค่าความเชื่อถือได้ 0.84 สถิติที่ใช้ในการวิเคราะห์ข้อมูล คือ ค่าเฉลี่ย ($\bar{X}$) และส่วนเบี่ยงเบนมาตรฐาน (S.D.)

  ผลการวิจัยพบว่า แมโครบนไมโครซอฟท์เอ็กซ์เซลสำหรับงานด้านการบริหารทรัพยากรบุคคล โดยใช้ภาษาวิชวลเบสิกสำหรับแอปพลิเคชัน คุณภาพโดยรวมเฉลี่ย 4.22 อยู่ในระดับดี ส่วนเบี่ยงเบนมาตรฐาน 0.85

คำสำคัญ: *แมโคร ไมโครซอฟท์เอ็กซ์เซล การบริหารทรัพยากรบุคคล ภาษาวิชวลเบสิกสำหรับแอปพลิเคชัน*

Abstract

The purposes of this research are 1) to develop Macro in Microsoft Excel for human resource management using Visual Basic for Applications and 2) to evaluate the quality of the Macro in Microsoft Excel for human resource management using Visual Basic for Applications, which was developed under the concept of the "System Development Life Cycle" consisting of 7 steps, i.e. 1) Problem Recognition, 2) Feasibility Study, 3) Analysis, 4) Design, 5) Construction, 6) Conversion and 7) Maintenance. The informants were 39 officers from the Human Resource Management Office, Office of the President at King Mongkut's Institute of Technology Ladkrabang. The research instruments of this research were 1) Macro in Microsoft Excel and 2) quality evaluation form of Macro in Microsoft Excel whose Item Objective Congruence (IOC) value was between 0.67 and 1.00 and the reliability value was 0.84. The statistics for analyzing the data were the average score $(\overline{X})$ and with a standard deviation (S.D.).

The results revealed that the quality evaluation of the development of Macro in Microsoft Excel for human resource management using Visual Basic for Applications, the average score was 4.22 (Good) with a standard deviation of 0.85.

Keywords: Macro, Microsoft Excel, Human Resource Management, Visual Basic for Applications

1. Introduction

In the present time, human resource management is an important component of any organizations in both public sector and private sector. It plays a strategic role in managing people, workplace culture and environment. Human resource management deals with issues related to seeking skilled people, employment, training, employee motivation, performance management, compensation, as well as safety, wellness, benefits and others. Lack of a good human resource management may see difficulty developing people to drive the organization (Hongsaeng, 2018).

In the time that business competitions turn more aggressive and more intense, the quality of staff and technology implementations contribute to competitive advantages to the organization in addition to its vision, mission, target, organizational culture, rules and regulations, and technology capability that drive the organization to success. As can be seen, the information technology has taken center stage in most business organizations as a tool of management and administration and becomes more important year by year. Organizations also allocate specific budgets for the information management. Information data play a strategic role in gaining competitive advantage in general markets and are adopted to increase productivity. The information technology is also used as a communication channel inside the organization (Rajaraman, 2018).

The major tasks of the human resource management concern the data management. The accuracy and completeness in processing data and presenting digits, graphs, charts, tables and other logics require advanced information technology which is rarely implemented by the Human Resource Management Officers. Most of its officers also have limited knowledge of computer and software application. Thus, the common-user-friendly Microsoft Excel program is proposed to help manage the data, aiming to reduce the risk of errors and mistakes, cut down workload and work procedures, and minimize the use of paper. The automatic function called Macro is also adopted to complete the tasks systematically (Simons, 2011).

Many difficulties occur in the work process at the Human Resource Management Office, Office of the President at King Mongkut's Institute of Technology Ladkrabang, such as managing and categorizing big data, issuing an official document with Thai number, converting Thai numbers to Arabic numbers, comparing each Microsoft Excel file with others, reducing and merging complex data, formatting data, repeating tasks that require much time, etc. These issues obstruct the office's productivity and achievement. The assigned officers would also experience work dissatisfaction caused by procrastination, excessive repetition, complicatedness, rejection and negative response. These undoubtedly cause a high rate of interagency transfers, and resignations in any Human Resource Management Offices.

From the significance mentioned above, the researcher conducted a study on the topic of "The Development of Macro in Microsoft Excel for Human Resource Management using Visual Basic for Applications", aimed for the implementation of a practical tool. The researcher also conducted an evaluation of the Macro to meet users' satisfaction. The Macro achievements could be applied as a guideline for further development in large data processing with quick response.

2. Objectives

1. To develop Macro in Microsoft Excel for human resource management using Visual Basic for Applications

2. To evaluate the quality of the Macro in Microsoft Excel for human resource management using Visual Basic for Applications

3. Materials and Methods

The research method is as follows:

3.1 Developing Macro in Microsoft Excel

The Macro in Microsoft Excel was developed under the "System Development Life Cycle (SDLC)" (Wetherbe, 1984) consisting of 7 steps:

1) Problem Recognition: The researcher collected necessary data and documents concerning of this research. The researcher also identified the organization's requirements which were necessary for the determination of the research framework and objectives by collecting all the problems occurring in the organization through interviewing (Chotikarn, 2015).

2) Feasibility Study: The researcher investigated the problems in deep to find the right solutions and selected the version of Microsoft Excel compatible with the Macro. The researcher also assessed the worthiness in every concern, in case that the project progressed as planned, including cost, time and efficiency increased from the development by displaying them in a tree chart to see clearly the development process of Macro in Microsoft Excel for human resource management using Visual Basic for Applications.

3) Analysis: The researcher created the Macro and its ecosystem based on the problems raised by users. The researcher acquired information from other researches concerning Macro in Microsoft Excel for human resource management using Visual Basic for Applications. The researcher also analyzed the problems and the solutions before creating the final Macro and its ecosystem.

4) Design: The researcher created a Logical Design based on the results to solve the problem. The design was firstly drafted on paper and then processed into System Design. In this step, the researcher specified technical features, usage details, adopted technology, version of Microsoft Excel, data input methods and output display. The overall design was expected to be accurate, convenient, user-friendly and help preventing human errors aimed for utmost satisfaction of users.

5) Construction: The researcher started coding to develop the draft on paper into the software with specific requirements, ran testing to find errors and corrected them. The researcher repeated the steps until the whole software was correct and met the requirements before having it used by users.

6) Conversion: The researcher installed the improved software in users' computers and started operating it. During the trial period, the users were allowed to use the new software and the old-fashioned method parallelly. As the time the users were able to use the software uninterruptedly, the old method was put off. However, the researcher still followed up to see users' reaction and solve the unexpected problems.

7) Maintenance: The researcher suggested the maintenance program to the organization despite the project end aiming for unexpected error prevention and further development. The maintenance officer needed to train new users to ensure they could work with the software without difficulties. The plan of further software evaluation was also recommended.

3.2 Creating evaluation forms

Key questions were specified to evaluate the Macro in Microsoft Excel for human resource management using Visual Basic for Applications focusing on "Software Quality" (April & Laporte, 2018) consisted of five features:

1) Usability

2) Efficiency

3) Reliability

4) Maintainability

5) Reusability

The assessment adopted a five-point numerical rating scale (Leekitchwatana, 2016). Table 1 displays quality assessment with a five-point numerical rating scale.

Table 1 Quality assessment with a five-point numerical rating scale

Score	Level
5	Very Good
4	Good
3	Satisfied
2	Poor
1	Very Poor

The "Content Validity" using the assessment points of definition congruence were given by five qualified experts (Leekitchwatana, 2016). Table 2 displays scale of definition congruence assessment points.

Table 2 Scale of definition congruence assessment points

Score	Congruence
+1	Congruent to the definition given
0	Congruency of the definition given unclear
-1	Not congruent to the definition given

The index of "Item Objective Congruence (IOC)" (Leekitchwatana, 2016) was calculated with the result of the previous query using the equation (1) below:

$$IOC = \frac{\sum R}{N} \tag{1}$$

Whereas: IOC = Item Objective Congruence

R = Assessment points given from all qualified experts

$\sum$ = Total assessment points

N = Number of qualified experts

The acceptable IOC index value was required to be over 0.5 or equal (IOC $\geq$ 0.5) and the IOC value of the evaluation form was between 0.67 and 1.00 in every question. Thus, this quality evaluation form was acceptable to apply as the reference of the research.

The reliability of the quality evaluation form was ensured with the internal consistency indicator of Cronbach's Alpha Coefficient (α) (Leekitchwatana, 2016) as shown in the equation (2) below:

$$\alpha = \frac{k}{k\text{-}1}\left\{1\text{-}\frac{\sum S_i^2}{S_t^2}\right\} \quad\quad (2)$$

Whereas:

α	=	Reliability value of the tool
k	=	Number of the items
$\sum$	=	Total assessment points
S_i^2	=	The average inter-item covariance among the items
S_t^2	=	The average variance

The acceptable level of the coefficient was 0.70 which indicated that the measurement of the scale has similar condition in the same subjects and the reliability value of quality assessment form was 0.84. Thus, this quality assessment form was acceptable to be applied as the reference of the research.

The assessment of the quality evaluation of Macro in Microsoft Excel for human resource management using Visual Basic for Applications adopted a five-point numerical rating scale (Leekitchwatana, 2016). Table 3 displays quality assessment with a five-point numerical rating scale.

Table 3 Quality assessment with a five-point numerical rating scale

Score	Level
4.50 - 5.00	Very Good
3.50 - 4.49	Good
2.50 - 3.49	Satisfied
1.50 - 2.49	Poor
1.00 - 1.49	Very Poor

4. Results

The results of the "The Development of Macro in Microsoft Excel for Human Resource Management using Visual Basic for Applications" research were as follows:

4.1 Results of the Macro development in Microsoft Excel

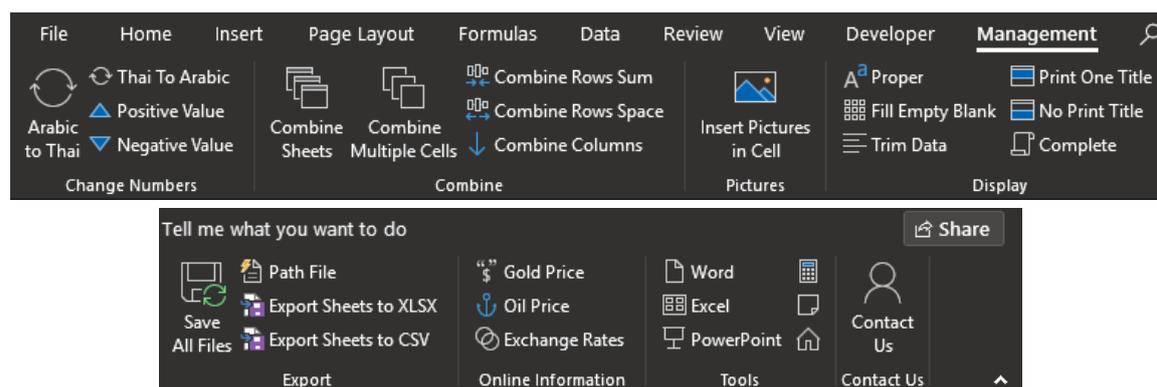The researcher studied and developed a set of tools with Macro as seen in Figure 1 displaying Tab management.

Figure 1 Tab management

A. Change Numbers: to automatically convert the input digits to Thai or Arabic numbers with positive or negative values.

B. Combine: to automatically combine the data set into the form convenient for the users.

C. Pictures: to manage the inserted picture in a cell automatically.

D. Display: to customize display options automatically.

E. Export: to manage files, save files and export files to another extension automatically.

F. Online Information: to provide updated information about gold price, oil price or exchange rate.

G. Tools: to run some of frequent software with ease.

H. Contact Us: to allow users to connect with the software developer.

4.2 Results of the Macro quality assessment

The quality assessment results of the Macro development in Microsoft Excel for human resource management using Visual Basic for Applications which were evaluated by five qualified experts of five features are as follows:

4.2.1 Results of the Macro quality assessment in five features

The results of the quality assessment of the Macro development in Microsoft Excel for human resource management using Visual Basic for Applications are shown in Table 4 displays Results of the Macro quality assessment in five features.

Table 4 Results of the Macro quality assessment in five features

Question list	$\overline{X}$	S.D.	Levels
1. Usability	4.31	0.79	Good
2. Efficiency	4.13	0.86	Good
3. Reliability	4.27	0.70	Good
4. Maintainability	3.90	1.12	Good
5. Reusability	4.28	0.83	Good
Average	4.22	0.85	Good

According to the quality assessment results of the Macro, as shown in Table 4, the average score was 4.22 (Good) with a standard deviation of 0.85. Considering each feature, the Usability (1.) ranked first with an average score of 4.31 (Good) with a standard deviation of 0.79, followed by the Reusability (5.) of which the score was 4.28 (Good) with a standard deviation of 0.83. The score of the Maintainability (4.) ranked last with an average score of 3.90 (Good) with a standard deviation of 1.12.

4.2.2 Results of the Macro quality assessment in each feature

The quality assessment results of the Macro development in Microsoft Excel for human resource management using Visual Basic for Applications in each feature are as follows:

Table 5 Quality assessment results of the Usability

Question list	$\overline{X}$	S.D.	Levels
1. Users are able to learn to use the Macro easily and quickly.	4.40	0.55	Good
2. Users are able to use the Macro easily and the Macro is convenient to new users.	4.60	0.55	Very Good
3. The Macro facilitates the work process.	4.80	0.45	Very Good
4. The Macro allows the data accuracy.	5.00	0.00	Very Good
5. The Macro helps saving time spent on the work.	4.60	0.55	Very Good
6. The Macro gives the work result of each user in the same format.	4.60	0.55	Very Good
7. The Macro menu is appropriate to the users' requirement	4.60	0.55	Very Good
8. The symbols on the Macro's command buttons are easily understandable for users.	2.60	0.55	Satisfied
9. The Macro gives the results appropriate to the users' requirement	4.60	0.55	Very Good
10. Shortcuts for the Macro are available	4.00	0.00	Good
11. The Macro communication is easily understandable for users.	3.60	0.55	Good
Average	4.31	0.79	Good

According to the quality assessment results of the Usability, as shown in Table 5, the average score was 4.31 (Good) with a standard deviation of 0.79. Considering each requirement, the data accuracy (4.) ranked first with an average score of 5.00 (Very Good) with a standard deviation of 0.00, followed by the work facilitation (3.) of which the score was 4.80 (Very Good) with a standard deviation of 0.45. The score of the simplicity of the symbols on the Macro's command buttons (8.) ranked last with an average score of 2.60 (Satisfied) with a standard deviation of 0.55.

Table 6 Quality assessment results of the Efficiency

	Question list	$\overline{X}$	S.D.	Levels
1.	The Macro has the correct and appropriate process on each command.	4.60	0.55	Very Good
2.	The Macro has the quick response.	4.40	0.89	Good
3.	The Macro requires less of CPU usage.	4.20	0.45	Good
4.	The Macro requires less of memory usage.	4.20	0.45	Good
5.	The source code processing is visible to users	3.20	1.30	Satisfied
6.	The Macro is safe and no user's information is remembered.	4.20	0.84	Good
	Average	**4.31**	**0.86**	**Good**

According to the quality assessment results of the Efficiency, as shown in Table 6, the average score was 4.31 (Good) with a standard deviation of 0.86. Considering each requirement, the score of the correctness and appropriateness (1.) ranked first with an average score of 4.60 (Very Good) with a standard deviation of 0.55, followed by the quick response (2.) of which the score was 4.40 (Good) with a standard deviation of 0.89. The score of the visibility of the source code (5.) ranked last with an average score of 3.20 (Satisfied) with a standard deviation of 1.30.

Table 7 Quality assessment results of the Reliability

	Question list	$\overline{X}$	S.D.	Levels
1.	No error occurs while running the Macro with large volume of data.	4.20	0.84	Good
2.	No sudden shutdown or restart on Microsoft Excel occurs while running the Macro.	4.80	0.45	Very Good
3.	Users can work with the Macro continuously and no reboot required.	3.80	0.45	Good
	Average	**4.27**	**0.70**	**Good**

According to the quality assessment results of the Reliability, as shown in Table 7, the average score was 4.27 (Good) with a standard deviation of 0.70. Considering each requirement, the score of no sudden shutdown or restart on Microsoft Excel occurred (2.) ranked first with an average score of 4.80 (Very Good) with a standard deviation of 0.45, followed by no error occurred (1.) of which the score was 4.20 (Good) with a standard deviation of 0.84. The score of no reboot required (3.) ranked last with an average score of 3.80 (Good) with a standard deviation of 0.45.

Table 8 Quality assessment results of the Maintainability

	Question list	$\overline{X}$	S.D.	Levels
1.	Users can manage their data easily and quickly after using Macro.	3.80	1.30	Good
2.	Users are allowed to modify source code when the output is not correct.	3.00	1.22	Satisfied
3.	The menu of Contact Developer is available on the Macro for further maintenance.	4.80	0.45	Very Good
4.	A clear and comprehensive user's manual of the Macro is available.	4.00	0.71	Good
	Average	**3.90**	**1.12**	**Good**

According to the quality assessment results of the Maintainability, as shown in Table 8, the average score was 3.90 (Good) with a standard deviation of 1.12. Considering each requirement, the score of availability of Contact Developer menu (3.) ranked first with an average score of 4.80 (Very Good) with a standard deviation of 0.45, followed by the clear and comprehensive user's manual (4.) of which the score was 4.00 (Good) with a standard deviation of 0.71. The score of source code modification allowed (2.) ranked last with an average score of 3.00 (Satisfied) with a standard deviation of 1.22.

Table 9 Quality assessment results of the Reusability

	Question list	$\overline{X}$	S.D.	Levels
1.	The Macro displays the interconnection of work and enable the better understanding of the framework.	4.20	0.45	Good
2.	The Macro is adaptable for various tasks of the human resource management.	5.00	0.00	Very Good
3.	The Macro helps expanding users' knowledge.	4.60	0.55	Very Good
4.	The Macro responds to the organization's growth and expansion on technology.	4.80	0.45	Very Good
5.	The Macro helps reducing the use of paper.	4.60	0.55	Very Good

6.	The Macro provides the appropriate result to the human resource management's requirement.	4.60	0.55	Very Good
7.	Users can easily install the Macro.	2.80	0.84	Satisfied
8.	The Macro can easily be installed on another computer with Microsoft Excel.	4.60	0.55	Very Good
9.	The Macro is compatible with Microsoft Excel of Office 365 and earlier versions.	3.80	0.84	Good
10.	The Macro is compatible with Windows 10 and earlier versions.	3.80	0.84	Good
	Average	**4.28**	**0.83**	**Good**

According to the quality assessment results of the Reusability, as shown in Table 9, the average score was 4.28 (Good) with a standard deviation of 0.83. Considering each requirement, the score of adaptability to various tasks (2.) ranked first with an average score of 5.00 (Very Good) with a standard deviation of 0.00, followed by the response to the organization's growth (4.) of which the score was 4.80 (Very Good) with a standard deviation of 0.45. The score of the ease of installation (7) ranked last with an average score of 2.80 (Satisfied) with a standard deviation of 0.84.

5. Discussion

The Macro in Microsoft Excel for human resource management using Visual Basic for Applications was developed under the concept of the "System Development Life Cycle" (Wetherbe, 1984) consisting of seven steps: 1) Problem Recognition, 2) Feasibility Study, 3) Analysis, 4) Design, 5) Construction, 6) Conversion and 7) Maintenance. The benefits of the research included: 1) Improve the work of data processing at the Human Resource Management Office, which was previously limited in completing the accurate tasks and efficiency of presentations of digits, graphs, charts, tables and other logics, 2) Automate the workflow and helping the Microsoft Excel users reduce the time spent on repetitive tasks, 3) Allow users with low knowledge of Microsoft Excel to complete more of complex tasks and 4) Help arrange the work results from different users into the same format. In addition, this research would be beneficial for further studies of the Macro development in Microsoft Excel for human resource management using Visual Basic for Applications. The research finding was consistent with the research on the "Software Development with Macro in Visual Basic for Applications using the Macro Recorder" (Hongsheng, 2010) proposing that the idea that using the Macro recorder and modifying some of work process with Visual Basic for Applications could allow the repetitive tasks on Microsoft Excel more accurate and more efficient. Thus, Macro is adaptable for various type of work, including repetitive tasks and tasks requiring high accuracy, depending on the logic and method applied, in the condition that the process and objectives are correct.

The quality assessment of the Macro development in Microsoft Excel for human resource management using Visual Basic for Applications focusing on "Software Quality" (April & Laporte, 2018) was evaluated by five qualified experts. According to the quality assessment results of the Macro, the average score was 4.22 (Good) with a standard deviation of 0.85. Considering each feature, the Usability ranked first with an average score of 4.31 (Good) with a standard deviation of 0.79, followed by the Reusability of which the score was 4.28 (Good) with a standard deviation of 0.83, followed by the Reliability of which the score was 4.27 (Good) with a standard deviation of 0.70, followed by the Efficiency of which the score was 4.13 (Good) with a standard deviation of 0.86. The score of the Maintainability ranked last with an average score of 3.90 (Good) with a standard deviation of 1.12. As demonstrated, the main quality of the Macro is the Usability because the achievement could be seen through users' actions while the Maintainability still requires improvement because maintenance process needs specific skills concerning source code which most users do not have. This finding is in accordance with the research of "The Development of Database System Prototype Concerning Environment and Health" (Kumpang, 2015) for which Microsoft Excel and Visual Basic for Applications were used as tools. The result of the research displayed that the storage of the data in the electronic file format allowed systematic sharing between users, helped reducing the repetitive data, improved data accuracy and enabled the ease of access. Most of all, the software helped deliver the users' tasks with completeness and accuracy. Thus, the Macro has been proven very useful to various types of work with great quality and appropriateness which could increase the value of works.

6. Conclusion

The Macro in Microsoft Excel for human resource management using Visual Basic for Applications was developed under the concept of the "System Development Life Cycle" (Wetherbe, 1984) consisting of seven steps: 1) Problem Recognition, 2) Feasibility Study, 3) Analysis, 4) Design, 5) Construction, 6) Conversion and 7) Maintenance.

The quality assessment results of the Macro, the average score was 4.22 (Good) with a standard deviation of 0.85. Considering each feature, the Usability ranked first with an average score of 4.31 (Good) with a standard deviation of 0.79, followed by the Reusability of which the score was 4.28 (Good) with a standard deviation of 0.83. The score of the Maintainability ranked last with an average score of 3.90 (Good) with a standard deviation of 1.12. However, due to few informants, the evaluation did not cover some criteria. Further data collection was recommended.

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